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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/051,762	01/16/2002	John B. Groe	000110	5545

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SEQUOIA COMMUNICATION
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EXAMINER	
LE, LANA N	

ART UNIT	PAPER NUMBER
2685	6

DATE MAILED: 10/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/051,762	GROE, JOHN B.	
	Examiner	Art Unit	
	Lana N Le	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,10-18 and 20* is/are rejected.

7)☒ Claim(s) *8,9,19 and 21-24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Preliminary Amendments

1. The preliminary amendment filed 04/09/02 has been received and placed of record in the file.

Specification

2. The abstract of the disclosure is objected to because there is a minor typo in line 2 where "on" before "a radio" should be "of". Correction is required. See MPEP § 608.01(b).

3. Applicant is reminded of the proper content of an abstract of the disclosure.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

-the last two lines of the abstract "so that..." shows the purported merits of the invention and should not be referred to.

Claim Objections

4. Claims 1-19 are objected to because of the following informalities:

- in claim 1, line 2, "at least one amplifier" should be "an at least one amplifier";

- in claim 1, line 3, after "adjusts", "the gain" should be "a gain";

- in claim 5, line 1, after "control circuit", "to control" should be "operates to control" to make sense of the function of the control circuit and correspond to the language of claim 7;

- in claim 6, line 3, after "having", "continuously variable gain" should be "a continuously variable gain";

- in claims 8-13, line 1, "wherein as" should be "wherein";

- in claim 16, line 10, after "margin and", "the linearity" should be "linearity";

- in claim 18, line 11, after "margin and", "the linearity" should be "linearity".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore,

the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 1-7, 15, 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Mohindra (US 6,442,380).

Regarding claim 1, Mohindra discloses a radio receiver (reference numbers 10-29 and 36-41 within radio device 1; fig. 1 and hereafter) comprising:

at least one amplifier (10);

a control circuit (26, 28, 29) coupled to the at least one amplifier (10), wherein the control circuit receives a quality indicator (RSSI 36-41; col 4, lines 51-65) and adjusts the gain of the at least one amplifier (10) based on the quality indicator (RSSI; col 4, lines 51-65; col 4, lines 15-22).

Regarding claim 2, Mohindra discloses the receiver of claim 1, wherein the at least one amplifier is an LNA (10) having continuous variable gain that receives an input RF signal (reference character "RF"; see figure 1; col 3, lines 60-62), and

wherein the LNA (10) includes a gain control input (gain control input at 10 from AGC 29) that is coupled to the control circuit (AGC 29) to receive a gain control signal (control circuit AGC outputs the gain control signal to the input of 10 for adjusting the gain of the LNA; col 4, line 15-23).

Regarding claim 3, Mohindra discloses the receiver of claim 2, further comprising a VGA (23, 24) coupled to receive an output of the LNA (10), and wherein the VGA includes a VGA control input (input at 25 from AGC 29 to block 23, 24) that is used to adjust a gain factor of the VGA (col 4, lines 15-23).

Regarding claim 4, Mohindra discloses the receiver of claim 3, wherein the control circuit (26, 28, 29) is further coupled to the VGA control input (input via control bus 25 from AGC 29 to block 23, 24) and the control circuit operates to control the gain factor of the VGA (col 4, lines 15-23; col 4, lines 51-65).

Regarding claim 5, Mohindra discloses the receiver of claim 4, wherein the control circuit operates to control the gain of the LNA and the VGA in tandem and individually (col 4, lines 1-22).

Regarding claim 6, Mohindra discloses a receiver for receiving via antenna 9 and demodulating an RF signal via 27 (numeral reference numbers 10-29 and 36-41 within radio device 1; fig. 1), the receiver comprising:

an LNA (10) having continuously variable gain coupled to receive the RF signal (incoming radio frequency signal; reference character "RF" in figure 1) and produce an amplified signal at an LNA output 11 (see figure 1 and hereafter; col 3, lines 60-62),

the LNA including an LNA control input to receive an LNA control signal that adjusts a gain factor of the LNA (gain control input at LNA 10 from AGC 29);

a VGA (23) coupled to the LNA output (via 13, 15) to receive the amplified signal (col 4, lines 1-12), the VGA (23) including a VGA output (output signal to block 19) that outputs a VGA output signal to downstream components (downstream components blocks 18-22, 26-31, 36-41) of the receiver, and

wherein the VGA (23, 24) includes a VGA control input (input via control bus 25 from AGC 29 to block 23, 24) to receive a VGA control signal that adjusts a gain factor of the VGA (col 4, lines 15-23; col 4, lines 51-65); and

a control network (26, 28, 29) coupled to the LNA control input and the VGA control input via 29, and wherein the control network operates to adjust the LNA and VGA gain factors based on a received power indicator of the RF signal (col 4, lines 15-22; col 4, lines 51-65; col 6, lines 20-24).

Regarding claim 7, Mohindra discloses the receiver of claim 6, wherein the control network (26, 28, 29) operates to control the gain of the LNA 10 and the VGA 23 in tandem and individually (col 4, lines 1-22; see figure 1).

Regarding claim 15, Mohindra discloses the receiver of claim 6, wherein the received power indicator is a received signal strength indicator (RSSI) signal (measured at 36-41; col 4, lines 51-55).

Regarding claim 18, Mohindra discloses a method of operating a receiver (numeral reference numbers 10-29, 36-41 within the radio device 1; see figure 1 and hereafter) to receive an RF signal (incoming radio frequency signal RF) via antenna (9),

the receiver comprises an LNA with continuously variable gain (variable gain low noise radio frequency amplifier 10) that receives the RF signal (incoming radio frequency signal RF) and produces an LNA output signal (at output 11) coupled to a VGA (23) via 13, 15 (col 3, lines 60-64),

the LNA (10) and VGA (23) have control inputs to receive control signals that set gain factors of the LNA and VGA respectively, (gain control input at 10 from AGC 29; input via control bus 25 from AGC 29 to block 23 respectively) the method comprising steps of:

determining that a received power level of the RF signal is varying within a first

selected power range (col 5, lines 10-30; col 3, lines 12-24);

adjusting the gain factor of the VGA (via 26, 28, 29) over signal line 25 (col 4, lines 15-16); and

adjusting the gain factor of the LNA together with the gain factor of the VGA (adjusting the gain factor of LNA 10 via gain control input at 10 from AGC 29 and the gain factor of VGA 23 input via control bus 25 from AGC 29 to block 23) with the intended use that a signal to noise ratio required for demodulation of the RF signal is inherently capable of being met with a selected margin and reducing the linearity requirements of the receiver.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (US 6,442,380) in view of Madni (US 6,480,066).

Regarding claim 10, Mohindra discloses the receiver of claim 6, wherein Mohindra fails to disclose the LNA comprises a shunt feedback circuit. Madni discloses a variable LNA with shunt feedback (col 3, lines 5-25; col 3, line 60 – col 4, line 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt a shunt feedback circuit of Madni to the LNA of Mohindra in order to set the input impedance and to avoid losing unnecessary power as suggested by Madni (col 3, line 66 – col 4, line 3).

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (US 6,442,380) in view of Imamura (JP 60-070,807).

Regarding claim 11, Mohindra discloses the receiver of claim 6, wherein Mohindra fails to disclose the LNA comprises a varactor used as a load of the LNA. However, Imamura discloses the LNA 1 comprises a varactor 10 used as a load (varactor 10 within the series resonance circuit 20) of the LNA 1 (see abstract, lines 4-5; page 3, lines 5-12; fig. 1; the written translation called the "varactor diode 10" of machine translated abstract a "variable capacity diode" 10 which represent the same numeral block 10 of figure 1 maybe due to the varactor's common characteristic of the capacitance junction being variable when a reverse voltage is varied across a pn junction). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt a varactor of Imamura to the LNA of Mohindra in order to suppress the level of the spurious signal as suggested by Imamura (see abstract, lines 1-2).

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (US 6,442,380) in view of Sakaki (JP 08-340226).

Regarding claim 12, Mohindra discloses the receiver of claim 6, wherein Mohindra fails to disclose the LNA comprises a pin diode used as a load of the LNA. However, Sakaki discloses:

the LNA comprises a pin diode (17, 18; fig. 1; para. 9 & 15) used as a load of the LNA (para. 9, lines 1-3 wherein the pin diode is used for input matching). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt a pin diode of Sakaki to the LNA of Mohindra in order to save power by turning off the RF input to the low noise amplifier as suggested by Sakaki (see abstract, lines 1-3) and also to achieve high isolation and low loss as is common in the art.

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (US 6,442,380) in view of Titus (US 6,628,170).

Regarding claim 13, Mohindra discloses the receiver of claim 6, wherein Mohindra fails to disclose the LNA includes a current-steering circuit. Titus discloses the LNA includes a current-steering circuit (col 4, lines 35-38). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a current steering circuit in order to allow the amplifier to adjust the gain between a maximum and a minimum value and capable of continuously varying the gain between those limits as suggested by Titus (col 4, lines 37-38).

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (US 6,442,380) in view of Mimura (US 6,295,451).

Regarding claim 14, Mohindra discloses the receiver of claim 6, wherein Mohindra doesn't further explicitly discloses the receive power indicator is an estimate of the bit energy per spectral noise density. Mimura discloses the receive power indicator is an estimate of the bit energy per spectral noise density (Eb/No; col 7, lines 49-53). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the receive power indicator as an estimate of the Eb/No in order to alternatively use any one of conceivably physical quantities (RSSI, Eb/No, S/N) to express a reception power as suggested by Mimura (col 7, lines 49-53) and specifically the bit energy per spectral noise density to find the energy to noise ratio and to extract the received power in the presence of noise.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (US 5,732,342) in view of Mohindra (US 6,442,380).

Regarding claim 20, Roth et al disclose a radio receiver (fig. 1) comprising:

a continuously variable RF amplifier (2; variable due to the arrow sign across the amplifier (see figure 1) and adjustable via gain control signal AGC1) coupled to a subsequent variable gain amplifier (5; variable due to the arrow sign across the amplifier, see figure 1 and adjustable via gain control signal AGC2) (col 1, line 65 - col 2, line 7);

a demodulator (6) to generate a gain control signal indicating a power level of a received signal (the demodulator generate an automatic gain control signal by sending a set voltage value to AGC circuit 10 to control the VGA2 and VGA5, and indicating a measured power level to automatic fading compensation circuit 10 to compensate for the fading signal level output from demodulator 6; col 2, lines 5-8); and

a control network (AGC 10) coupled to receive the gain control signal to optimally set the gain of the variable RF amplifier (2) and the variable gain amplifier (5) (col 7, lines 16-24).

However, Roth et al do not specifically disclose:

the variable RF amplifier is an LNA. Mohindra discloses a variable LNA 10 in a similar AGC control circuit (fig. 1; col 3, lines 60-62). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the variable LNA of Mohindra to the radio receiver of Roth et al in order to amplify a signal with little or no noise interference.

Allowable Subject Matter

13. Claims 8-9, 19, and 21-24 would be allowable if rewritten to overcome the minor claim objection(s) set forth in this Office action set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Regarding claim 8, Mohindra discloses the receiver of claim 7. However, Mohindra and the cited prior art fail to further disclose as the received power of the RF signal increases to a selected level, the control network operates to maintain the gain factor of the VGA and decrease the gain factor of the LNA.

Regarding claim 19, Mohindra discloses the method of claim 18. However, Mohindra and the cited prior art fail to disclose the method further comprising steps of:

determining that the received power level of the RF signal is varying within a second selected power range;

maintaining the gain factor of the LNA; and

adjusting the gain factor of the VGA so at the signal-to-noise ratio required for demodulation of the RF signal is met.

Regarding claim 21, Roth et al and Mohindra discloses the control network of claim 20. However, Roth et al, Mohindra, and the cited prior art fail to further disclose: the control network adjusts the gain of the continuously variable gain LNA and subsequent VGA in a way that minimizes LNA gain while maintaining the required signal quality for proper demodulation, the control network comprising:

an input for receiving a received signal strength indicator (RSSI);

an input for receiving a quality indicator of the demodulated signal; and

logic to perform a mapping function wherein the gain of the LNA and VGA are controlled optimally.

14. Claims 16-17 would be allowable if rewritten to overcome the minor claim objection(s) set forth in this Office action.

Regarding claim 16, Mohindra (US 6,442,380) discloses a method of operating a receiver to receive an RF signal (incoming radio frequency signal), the receiver comprises an LNA with continuously variable gain (10) that receives the RF signal and produces an LNA output signal coupled to a VGA (23) (see figure 1; col 3, lines 60-62),

the LNA (10) and VGA (23) have control inputs to receive control signals that set gain factors of the LNA and VGA respectively (gain control input at 10 from AGC 29; input at 25 from AGC 29 to block 23 respectively; see fig. 1), the method comprising steps of:

determining that a received power level of the RF signal is varying within a first selected power range (col 5, lines 10-30; col 3, lines 12-24).

However, Mohindra and the cited prior art fail to further disclose:

maintaining the gain factor of the VGA;

adjusting the gain factor of the LNA so that a signal-to-noise ratio required for demodulation of the RF signal is met with a selected margin and the linearity requirements of the receiver are reduced.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Oomoto et al (JP 04-053,312), PCM Audio Broadcast Receiver (fig. 2).

- Ou (US 5,862,465), Hysteresis-Free Anti-Saturation Circuit.

- Baldwin et al (US 6,560,448), DC Compensation System for a Wireless Communication Device Configured in a Zero Intermediate Frequency Architecture.

- Poirier et al (US 6,625,433), Constant Compression Automatic Gain Control Circuit.

- Vu et al (US 6,002,925), Radio Frequency Transceiver and Subassemblies Thereof.

- Yamanaka et al (US 2001/0053680), Automatic Gain Control Circuit for Controlling Two AGC Amplifiers.

- Kamgar et al (US 6,324,387), LNA Control-Circuit for Receive Closed Loop Automatic Gain Control.

- Katsura et al (US 6,373,907), Wireless Terminal Device.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lana N Le whose telephone number is (703) 308-5836. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward F Urban can be reached on (703) 305-4385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lana Le

September 21, 2004